

Original Research Article

<https://doi.org/10.20546/ijcmas.2020.907.391>

Efficacy of Sea Weed Extract-Sagarika (Liquid) for Enhancing the Productivity of Green Gram (*Vigna radiata* L.)

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ABSTRACT

Keywords

Green Gram
(*Vigna radiata* L.),
of Sea Weed
Extract-Sagarika

Article Info

Accepted:

22 June 2020

Available Online:

10 July 2020

A field experiment on green gram was conducted during *kharif* 2018 and 2019 at UAS Dharwad, Karnataka on clayey soil. The experiment consisted of seven treatments including seed treatment and foliar spray of sea weed extract-Sagarika (liquid) along with recommended seed treatment. The Sagarika was sprayed once or twice along with recommended seed treatment and NPK consortia. It was sprayed at pre flowering and pod formation stages. The experiment was replicated thrice under Randomized Complete Block Design. The pooled results indicated that all the treatments involving Sagarika were significantly on par with each other. The treatment, RDF(25:50 kg NP ha⁻¹) + recommended seed treatment (*Rhizobium*+ PSB) + Sagarika @ 0.1 % seed soaking + Sagarika @ 0.25 % foliar spray at pre flowering stage recorded significantly higher seed yield (880 kg ha⁻¹) and net returns (Rs.34534 ha⁻¹) followed by RDF with NPK consortia seed coating @ 10 ml/kg seed + Sagarika @ 0.25 % foliar spray at pre flowering stage (874 kg ha⁻¹ and Rs.34320 ha⁻¹, respectively) and RDF with recommended seed treatment + Sagarika @ 0.1 % for seed soaking (827 kg ha⁻¹ and Rs.31923 ha⁻¹, respectively).

Introduction

Green gram (*Vigna radiata* L.) is the third most important food legumes grown and consumed in India and is also an important *kharif* legume of northern Karnataka. It is sown along with onset of monsoon. Normally farmers do not apply the recommended fertilizers including seed treatment because of its shorter duration. Though the productivity is low, they value this crop for leaf fall and the subsequent advantages to the succeeding crop. The simple and low cost production technologies like seed treatment and foliar nutrition can boost the productivity,

increasing the monetary benefits. There are reports that sea weed extracts as organic bio-stimulants is fast becoming accepted practice due to its beneficial effects (Verkleij, 1992). In green gram, sea weed extract enhanced the seed germination and performance of growth and yield parameters (Kavipriya *et al.*, 2011). This technology is simple and cost effective. Keeping in view the beneficial effects of sea weed extract, the study was initiated with Sagarika (liquid) with the following objectives include effect of sagarika foliar spray along with recommended seed treatment on growth and yield of green gram. And also study about economic analysis of

the system.

Materials and Methods

A field experiment was conducted at UAS Dharwad, Karnataka during *khari* 2018 and 2019 in Northern transition zone of Karnataka under clayey soil. The soil was having low available nitrogen (243 kg ha⁻¹), medium available phosphorus (27 kg ha⁻¹) and medium available potassium (263 kg ha⁻¹) with neutral pH. The experiment consisted of seven treatments replicated thrice in Randomized Complete Block Design. The green gram variety used was DGGV-2. The treatments consisted of T₁: RDF (25:50 kg NP ha⁻¹) with recommended seed treatment (*Rhizobium* @ 500 g + PSB @ 1250 g ha⁻¹), T₂: RDF with NPK consortia seed coating @ 10 ml/kg seed, T₃: T₂ + Sagarika @ 0.25 % (one spray), T₄: T₂ + Sagarika @ 0.25 % (two spray), T₅: T₁ + Sagarika @ 0.1 % (seed soaking for 30 min), T₆: T₅ + Sagarika @ 0.25 % (one spray) and T₇: T₅ + Sagarika @ 0.25 % (two spray) at pre flowering and pod formation stages. The biometric observations were recorded at peak growth stage and yield parameters at maturity. Recommended cultivation practices were followed for all the treatments along with RDF.

Results and Discussion

Growth and yield attributes (cf. Table 1 and 2)

The pooled data indicated that the seed yield of green gram was significantly influenced by all the sea weed extract-Sagarika involving treatments compared to recommended seed treatment (*Rhizobium* and PSB) and NPK consortia seed coating. However, all the treatments (T₃ - T₇) involving liquid Sagarika (sea weed extract) recorded significantly higher seed yield (810-880 kg ha⁻¹). The treatment T₆, involving RDF + recommended

seed treatment (*Rhizobium*+ PSB) + Sagarika @ 0.1 % seed soaking + Sagarika @ 0.25 % foliar spray at pre flowering stage recorded significantly higher green gram seed yield of 880 kg ha⁻¹ followed by T₃, involving RDF with NPK consortia seed coating @ 10 ml/kg seed + Sagarika @ 0.25 % foliar spray at pre flowering stage (874 kg ha⁻¹) and T₅ *i.e.*, RDF with recommended seed treatment (*Rhizobium* + PSB) + Sagarika @ 0.1 % for seed soaking (827 kg ha⁻¹).

The seed yield was significantly lower with only recommended biofertilizer treatment and NPK consortia seed coating. The higher seed yield of green gram recorded with Sagarika (sea weed extract) treatments was due to better performance of growth and yield parameters *viz.*, plant height (68.0-76.8 cm), number of branches (4-5 per plant), number of pods (11.8-14.8 per plant) and seed yield (11.0-14.6 g per plant). Similar trend followed during 2018 and 2019.

However, seed yield per plant and per ha were non significant during 2018. These results are in conformity with the findings of Kavipriya *et al.*, (2011) who obtained better seed germination and growth parameters in green gram with sea weed extract as a bio-stimulant. Zodape *et al.*, (2010) also reported significantly increased seed yield and yield parameters over control with sea weed extract applied treatments in green gram.

Saishankar (2001) stated that, foliar spray with NAA @ 40 ppm in green gram, twice at the time of flowering and 15 days after flowering increased the plant height, number of branches and flowers per plant over control. Sujatha (2001) reported that, foliar application of salicylic acid (100 ppm) on green gram at 75 days after sowing increased the number of pods per plant, number of seeds per pod, seed weight per plant, 100 seed weight and grain yield (840 kg ha⁻¹).

Table.1 Growth and yield parameters of green gram as influenced by sea weed extract-Sagarika (liquid)

Treatment	Plant height (cm)			Number of branches per plant			Number of pods per plant			Seed yield (g plant ⁻¹)		
	2018	2019	Pooled	2018	2019	Pooled	2018	2019	Pooled	2018	2019	Pooled
T₁: RDF with recommended seed treatment	67.7	58.6	63.1	4.0	4.0	4.0	13.2	8.3	10.8	12.0	9.2	10.6
T₂: RDF with NPK Consortia seed coating @10 ml/kg seed	63.7	61.4	62.5	4.0	4.0	4.0	13.0	8.0	10.5	11.7	9.8	10.8
T₃: T₂ + Sagarika @0.25 % (one spray)	76.7	62.5	69.6	5.0	5.0	5.0	18.5	9.7	14.1	17.0	11.5	14.3
T₄: T₂ + Sagarika @0.25 % (two spray)	73.5	65.4	69.5	4.0	3.0	3.0	14.0	10.3	12.2	13.9	9.7	11.8
T₅: T₁ + Sagarika @0.1 % (seed soaking for 30 min)	76.3	68.5	72.4	4.0	4.3	4.0	15.0	8.7	11.8	15.9	9.7	12.8
T₆: T₅ + Sagarika @0.25 % (one spray)	80.2	73.4	76.8	4.0	5.0	4.0	20.3	9.3	14.8	17.2	11.9	14.6
T₇: T₅ + Sagarika @0.25 % (two spray)	72.8	63.2	68.0	4.0	3.7	4.0	13.8	11.0	12.4	12.1	9.9	11.0
S.Em.±	3.76	5.88	3.66	0.48	0.44	0.35	1.92	0.87	1.25	3.10	0.67	1.24
C.D. (P = 0.05)	11.58	NS	11.27	NS	1.36	1.09	5.91	2.67	3.84	NS	2.07	3.65

Note: Foliar spray: 1st at pre flowering and 2nd at pod formation stage

Table.2 Seed and haulm yield of green gram as influenced by sea weed extract-Sagarika (liquid)

Treatment	Seed yield (kg ha ⁻¹)			Haulm yield (kg ha ⁻¹)			Harvest Index (%)		
	2018	2019	Pooled	2018	2019	Pooled	2018	2019	Pooled
T₁: RDF with recommended seed treatment	893	606	750	527	506	517	62.79	54.48	58.64
T₂: RDF with NPK Consortia seed coating @10 ml/kg seed	871	584	728	524	497	511	62.53	53.89	58.21
T₃: T₂ + Sagarika @0.25 % (one spray)	1006	742	874	506	529	517	66.97	58.24	62.61
T₄: T₂ + Sagarika @0.25 % (two spray)	996	651	823	483	493	488	67.31	56.83	62.07
T₅: T₁ + Sagarika @0.1 % (seed soaking for 30 min)	1002	653	827	568	526	547	63.84	55.22	59.53
T₆: T₅ + Sagarika @0.25 % (one spray)	1038	722	880	523	511	517	66.41	58.53	62.47
T₇: T₅ + Sagarika @0.25 % (two spray)	979	642	810	489	475	482	67.14	57.17	62.16
S.Em.±	69	38	40	57	30.11	23.35	2.43	2.31	1.21
C.D. (P = 0.05)	NS	119.0	118	NS	NS	NS	NS	NS	3.58

Note: Foliar spray: 1st at pre flowering and 2nd at pod formation stage

Table.3 Economic parameters of green gram cultivation as influenced by sea weed extract-Sagarika (liquid)

Treatment	Cost of cultivation (Rs. ha ⁻¹)		Gross returns (Rs. ha ⁻¹)			Net returns (Rs. ha ⁻¹)			B:C ratio		
	2018	2019	2018	2019	Pooled	2018	2019	Pooled	2018	2019	Pooled
T₁: RDF with recommended seed treatment	21725	21855	54376	43258	48817	32651	21403	27027	2.50	1.98	2.24
T₂: RDF with NPK Consortia seed coating @10 ml/kg seed	21695	21825	53023	41706	47364	31328	19881	25604	2.44	1.91	2.18
T₃: T₂ + Sagarika @0.25 % (one spray)	22560	22710	61100	52811	56955	38540	30101	34320	2.71	2.33	2.52
T₄: T₂ + Sagarika @0.25 % (two spray)	23385	23495	60459	46382	53420	37074	22887	29980	2.59	1.97	2.28
T₅: T₁ + Sagarika @0.1 % (seed soaking for 30 min)	21775	21885	60956	46551	53753	39181	24666	31923	2.80	2.13	2.46
T₆: T₅ + Sagarika @0.25 % (one spray)	22600	22730	63067	51331	57199	40467	28601	34534	2.79	2.26	2.52
T₇: T₅ + Sagarika @0.25 % (two spray)	23425	23535	59489	45670	52579	36064	22135	29099	2.54	1.94	2.24
S.Em.±	---		3368	2676	2233	3368	2676	2233	0.15	0.12	0.10
C.D. (P = 0.05)	---		NS	8247	6881	NS	8247	6881	NS	0.36	0.31

Note: 1) Foliar spray: 1st at pre flowering and 2nd at pod formation stage 2) Selling price: Seeds-Rs.60/kg, Haulm-Rs. 1500/t

Fig.1 High yielding treatments T₆: RDF with recommended seed treatment +Sagarika @0.1 % (seed soaking for 30 min) + Sagarika @ 0.25 % (one spray)



Fig.2 T₃: RDF with NPK Consortia seed coating @10 ml/kg seed + Sagarika @ 0.25 % (one spray)



Fig.3 T₅: RDF with recommended seed treatment + Sagarika @ 0.1 % (seed soaking for 30 min)



The haulm yield did not show significant effect due to treatments. However, pooled data showed that, it ranged from 482-547 kg ha⁻¹. This indicated the influence of sea weed extract-Sagarika more on reproductive phase of the crop.

Economics (cf. Table 3)

The monetary indicators followed the similar trend of seed yield. All the treatments involving Sagarika recorded significantly higher gross and net returns and were on par with each other. The treatments (pooled results) involving sea weed extract-Sagarika (liquid) recorded significantly higher net returns (Rs. 29099-34534 ha⁻¹) and B:C ratio (2.24-2.52) compared to only biofertilizer or NPK consortia application treatments. The increased monetary benefits were due to higher seed yield recorded with these treatments. These results are in conformity with the findings of Dixit and Elamathi

(2007) in green gram with foliar spray of DAP 2.0 per cent + NAA 40 ppm + B 0.2 per cent + Mo 0.05 per cent at 30 DAS resulting in higher benefit cost ratio (1.97) over control (1.45).

In conclusion,

Irrespective of seed soaking or foliar spray, the productivity of green gram was enhanced with application of sea weed extract-Sagarika (liquid).

RDF + recommended seed treatment (*Rhizobium*+ PSB) + Sagarika @ 0.1 % seed soaking + Sagarika @ 0.25 % foliar spray at pre flowering stage recorded significantly higher seed yield (880kg ha⁻¹) and net returns (Rs.34534 ha⁻¹) followed by RDF with NPK consortia seed coating @ 10 ml/kg seed + Sagarika @ 0.25 % foliar spray at pre flowering stage (874 kg ha⁻¹ and Rs.34320 ha⁻¹, respectively) and RDF with recommended

seed treatment + Sagarika @ 0.1 % for seed soaking (827 kg ha⁻¹ and Rs.31923 ha⁻¹, respectively).

Since sea weed extract is eco-friendly and cheaper, it can be promoted along with biofertilizer as a bio-stimulant.

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How to cite this article:

Alagundagi, S. C. 2020. Efficacy of Sea Weed Extract-Sagarika (Liquid) for Enhancing the Productivity of Green Gram (*Vigna radiata* L.). *Int.J.Curr.Microbiol.App.Sci.* 9(07): 3351-3357. doi: <https://doi.org/10.20546/ijcmas.2020.907.391>